Set-01

Symbol of Secularism & National Integration

ANJUMAN-I-ISLAM'S 2013-14
KALSEKAR TECHNICAL CAMPUS, NEW PANVEL
School of Engineering & Technology

Subject: Heat and Mass Transfer **Date:** 06 Sept 2013
Marks 30 **Duration:** 1 Hr 00 Minutes
Class: T.E. (Sem V) Unit Test I **Branch:** Mechanical

Instructions:

i) All Questions are compulsory. ii) Each Question carries 10 Marks.

Q 1 A) [10 Marks]

What do you understand by 'critical radius of insulation'? Derive an expression for critical radius of insulation in case of cylindrical object. State the physical signification and application of 'critical radius' in industry.

OR

Q 1 B) [10 Marks]

Derive the general of heat conduction in Cartesian co-ordinates for an isotropic material. Simplify it in the form of Poison's equation.

Q 2 A) [12 Marks]

A 2.5 cm outside diameter refrigerant suction line is required to be insulated. Outside surface heat transfer co-efficient is 9.5 W/m2 K. Thermal conductivity of insulation selected is 0.18 W/.m K.

i) Verify whether insulation would be effective or not.
ii) What will be maximum value of thermal conductivity of insulation so as to reduce heat transfer?
iii) What should be the thickness of cork insulation to reduce the heat transfer to 20 % of bare object, if thermal conductivity of cork is 0.04 W/ m K.

OR

Q 2 B) [12 Marks]

A furnace wall is made up of three layers of thickness 250mm, 100 mm and 150 mm, having thermal conductively of 1.65, 9.20 and k3 (W/m K) respectively. The inside surface is exposed to gases of furnace at 1250 C, with heat transfer co-efficient of 25 W/ m2 K and inside surface temperature of 1100 C. The outside surface, with heat transfer co-efficient of 12 W /m2 K, is exposed to air at 25 C. Determine

i) Heat loss per unit area?
ii) Thermal conductivity, k3?
iii) The over-all heat transfer co-efficient? and
iv) The internal surface temperatures?

Q 3 A) [08Marks]

State the advantages and limitations of 'Dimensional Analysis' and also Explain 'Non-dimensional' numbers used in convection heat transfer.

OR

Q 3 B) [8 Marks]

Discuss the development of thermal boundary layer in circular pipe and bring out the concept of thermal entry region, fully developed thermal region and length of thermal region.

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KALSEKAR TECHNICAL CAMPUS, NEW PANVEL
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Subject: Fluid Mechanics
Marks: 30
Class: T.E. (SEM-V) Unit Test I

Date: Sept. 13
Duration: 1 Hr/s.
Branch: Mechanical

Instructions:

(1) Both questions are compulsory.

(2) Assume suitable additional data if necessary.

Q.1 Attempt any THREE (3×4)

a) Differentiate between the Eulerian and Lagrangian method of representing the fluid motion.

b) Prove that streamline s and equipotential lines are orthogonal to each other.

c) Explain briefly the following terms

(i) Mass density (ii) Weight density (iii) Specific gravity (iv) Buoyancy

d) Define path lines, streamlines, streak lines, stream tubes.

e) Convert the following

(i) -300mm of Hg into N/m^2 (absolute)

(ii) 125990 Pa (absolute) into meters of oil column gauge, specific gravity of oil is 0.8.

Q.2 Attempt any THREE (3×6)

a) Derive the expression for total pressure and centre of pressure for an inclined surface submerged in a fluid.

b) A rectangular pontoon floating in sea water is 21m long, 7m wide, 2.4m deep and has a mass of 150 tonne. It carries on its upper deck a normal vertical load 100 tonne. C.G of the load is 2.4m above the deck (top surface). Find the metacentre height.

c) Write the mathematical expression of continuity equation in Cartesian as well as polar co-ordinates for

(i) 3-D flow (general equation)

(ii) 3-D steady, incompressible flow.

(iii) 3-D steady, uniform, incompressible flow.

d) An isosceles triangle plate of base 4m and altitude 6m is immersed vertically in water. Its axis of symmetry is parallel to and at a depth of 6m from free water surface. Calculate magnitude and location of total pressure.

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ANJUMAN-I-ISLAM'S (2013-14)
KALSEKAR TECHNICAL CAMPUS, NEW PANVEL
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Subject:MMM
Marks: 20
Class: TE (Sem V) Unit Test I

Date: Sept. 13
Duration: 1 Hr.
Branch: ME

Instructions: (1) All questions are compulsary there may be internal options.

(2) Figures to the right indicate full marks.

Q.1 Attempt any two of the following. [10]

1. Draw a block diagram of a generalised measuring system. Write down the functions performed by each element.
2. Explain the term drift and also give classification of drift.
3. Prove that for a strain gauge $G_f = 1+2\mu+(d\rho/\rho).e$.

Q.2 Attempt any two of the following. [10]

1. The unknown resistance in a wheatstone bridge is measured by using three known resistances such that

   $R_4=R_2R_3/R_1$

   Where, $R_1= 50\pm 0.5\%\Omega$; $R_2=500\pm0.5\%\Omega$; $R_3=440\pm 0.5\%\Omega$.

   Determine the magnitude of the unknown resistance R4 and the limiting error in percentage and in ohm (for unknown resistance).
2. Explain briefly the following terms

   (i) Repeatability (ii) Reproducibility

   (iii)Span.
3. Write short note on Null and Deflection type of instruments.

********** ****ALL THE BEST**********

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ANJUMAN-I-ISLAM'S
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School of Engineering & Technology

Subject: Theory of Machines-II | Date: Sept. 13
Marks: 30 | Duration: 1 Hr
Class: TE Mechanical (Sem V) Unit Test I | Branch: Mechanical

Instructions: 1) Question No. 1 is compulsory
2) Attempt any 2 of remaining questions
3) All questions carry 10 marks

1) Write a short note on following
   a) Self locking and self energizing brakes
   b) Prony brake dynamometer

2) A conical clutch has a cone angle of 30 degrees, if the maximum intensity of pressure between the contact surfaces is limited to 70 kPa and the width of the conical surface is not to exceed $1/3^{rd}$ of the mean radius. Find the dimensions of the contact surfaces to transmit 22 kW at 2000 rpm assuming uniform wear and take coefficient of friction as 0.15

3) A car moving on a level road at a speed 50 km/h has a wheel base 2.8 metres, distance of C.G. from ground level 600 mm, and the distance of C.G. from rear wheels 1.2 metres. Find the distance travelled by the car before coming to rest when brakes are applied,
1. to the rear wheels, 2. to the front wheels, and 3. to all the four wheels.
The coefficient of friction between the tyres and the road may be taken as 0.6

4) A band and block brake, having 12 blocks each of which subtends an angle of 13 degrees at the center, is applied to the drum of 1m effective diameter. The drum and flywheel mounted on the same shaft has a mass of 2000 kg and a combined radius of gyration of 500 mm. The two ends of the band are attached to pins on opposite side of the brake lever at distance of 30 mm and 120 mm from the fulcrum. If a force of 200 N is applied at a distance of 750 mm from the fulcrum. Take coefficient of friction as 0.3. find,
   1) Maximum braking torque
   2) Angular retardation of the drum
   3) Time taken by the system to come to rest from the rated speed of 360 rpm

----------Best of Luck----------